transition from the current methods to those in TIS; maintaining existing ArcInfo (available from ESRI, Inc.) road network data allows the production of many of the reports required by existing users using either the new TIS methods or the existing ones.

[0067] The exemplary embodiment of the invention is integrated with commercial off-the-shelf desktop mapping and GIS software, e.g., ArcView GIS, ArcInfo and other software available from ESRI, Inc. These state of the art systems use link-node networks to represent roads. The present invention maintains compatibility with this scheme, while utilizing permanent Anchor Sections.

[0068] Referring now to Figure 4, there is shown a block diagram depicting the maintenance of Anchor LRMs. This maintenance process requires three primary modifications from the existing methods: (1) the existing ArcInfo tables 400 include the Anchor Section ID associated with each ArcInfo Link, (2) the existing maintenance application generates a transaction log 402 identifying changes to the ArcInfo Link-Node network 403, and (3) a new publication application 404 uses this transaction log 402 to update the TIS Anchor Section data 400 and propagate changes to the historical TIS Database 405, as necessary. In one embodiment, software tools (1) inform the user of "orphaned" road characteristic (RC) data (e.g., RC data that is gathered before the line work for that road is generated) to help manage the Anchor LRM maintenance process and (2) identify Anchor Sections without RC data so that the appropriate RC data can be gathered and entered.

[0069] The Anchor LRM provides a uniform linear referencing method that can be used for all TIS data. However, many existing applications use other LRM's (e.g., RCLink, county-route-milepost). Therefore, a method for data translation is implemented. Figure 5 shows the method used to support translation between other LRM's and the Anchor LRM. For example, the system automatically converts between an RCLink linear reference and a linear reference based on the Anchor LRM.

[0070] Referring now to Figure 5, a TIS LRM (other than the Anchor LRM) is defined by (a) a collection of traversals 501, which are a linear sequence of Anchor Sections (or Anchored Linear Events), and (b) linear referencing tie-points 502 that relate the linear measure on a traversal to those of on the underlying Anchor Sections. For example, the location specified by the data "Traversal A, mile 0.8" (503) equates to the Anchor LRM reference "Anchor Section 1, offset 0.8," and the location specified by "Traversal A, mile 2.2" equates to the Anchor LRM reference "Anchor Section 2, offset 0.7" (504). The location specified by "Traversal A from mile 0.8 to mile 2.2" equates to the Anchor LRM reference "Anchor Section 1 from offset 0.8 to offset 1.5 (505) plus Anchor Section 2 from offset 0.0 to offset 0.7.

[0071] When a user enters new data into a TIS application, they enter the data using a familiar LRM. Before storing the data, the TIS application converts the LRM location reference from the familiar LRM to the Anchor LRM. When displaying data for a user, the opposite process is used to convert an Anchor LRM location into a LRM location, of an appropriate type as specified by the user. Figure 6 illustrates this process for the RCLink LRM. In addition to the LRM translation process for

converting between the Anchor LRM and other LRM's, the system also provides user screens for maintaining the LRM translation tables (i.e., for defining the LRM in terms of the underlying Anchor Sections).

[0072] Referring now to Figure 6, the TIS has a linear referencing system (LRS) translation application which serves as a bridge between the TIS data using an Anchor LRS 602 and an existing LRS 604 which uses the RCLink LRM. A user can input or view data in TIS in an existing LRM such as RCLink because the user interface 606 is integrated with an LRS translation application 600 which is able to access translation tables 610 which correlate data using the RCLink LRM with data using the Anchor LRM. The Anchor LRS 604 also has a maintenance application 608 to maintain the translation tables as RCLink data is modified.

[0073] Referring now to Figure 9, the process for storing event data is shown. In TIS, event data (e.g., road characteristic data) is stored in a table that includes columns for (a) the event value 91 and (b) the Anchored Linear Event 92 to which the event applies. Events that span multiple Anchor Sections 93 are stored in multiple rows in the event table 94. An event table can be supplemented by additional columns if more detailed event locations (e.g., road divisions, road lanes) are required.

[0074] An event value (e.g., pavement type) may apply to several disjoint portions of an Anchor Section. Referring to Figure 7, an anchor section 71 is shown which has varying attributes for disjoint portions of the section. For instance, portions one (reference 72) and three (reference 73) may be asphalt pavement and portion three (reference 74) may be cement. The event table supports multiple entries for the same